Effects of Sulfur, Calcium Source and pH on Microdochium Patch

Alec Kowalewski, Brian McDonald, and Clint Mattox
Oregon State University

Start Date: 2014
Project Duration: 3 years
Total Funding: $24,084

Turfgrass and Environmental Research Online
Volume 14, Number 2 | March—April 2015

Objectives:

1. *Sulfur applications slowed the infection process of Microdochium patch on an annual bluegrass putting green.*
2. *Sulfur applications resulted in fewer curative fungicide applications when using the development of infection centers as an action threshold to control Microdochium patch.*
3. *Sulfur applications decreased turf color and increased Anthracnose activity when summer fungicides were not applied.*

Historically, more money is spent on fungicides to combat Microdochium patch (Microdochium nivale) in the Pacific Northwest and Western Canada than any other turfgrass disease. As a result of the financial burden and the potential for development of fungicide resistance associated with frequent fungicide applications, as well as growing pesticide bans and restrictions, turf managers as a whole are looking for methods to mitigate pesticide applications. Therefore, the primary objective of this research is to determine if sulfur applied with and without various calcium sources can reduce the number of annual fungicide applications necessary to manage Microdochium patch on annual bluegrass.

Materials and Methods:

Field research will be conducted on an annual bluegrass putting green vegetatively established in 2004

Table 1: Effects of sulfur rate and calcium source on Microdochium patch infections centers observed on March 31, 2014, and the number of fungicide applications made to control Microdochium patch from November 1, 2013 to May 31, 2014, Corvallis, OR.

Sulfur rate[z]	Microdochium patch infection centers		Number of Microdochium patch fungicide applications[y]	
0 lbs	12.2	a[x]	3.9	a
3 lbs	3.7	b	2.9	b
6 lbs	0.3	b	2.3	c
Calcium source[w]				
None	5.6	a	3.0	a
Calcium carbonate	10.4	a	3.2	a
Calcium sulfate	2.4	a	2.9	a
Calcium phosphate	3.1	a	3.1	a

[Z] 3 and 6 lbs sulfur per 1,000 ft2 annually, applied at 0.25 and 0.5 lbs per month x 12 months, respectively.
[X] Within columns, means followed by the same letter are not significantly different according to $LSD_{(0.05)}$.
[Y] Fungicide applications of propiconazole plus PCNB (2.0 fl. oz. + 6.0 fl. oz./1,000 ft^2) were made on a per plot basis using the following infection threshold, 5 small spots or one spot exceeding 1 inch in diameter from 1 October 2013 to 31 May 2014.
[X] Within columns, means followed by the same letter are not significantly different according to $LSD_{(0.05)}$.
[W] All calcium sources were applied at a rate of 12 lbs product per 1,000 ft^2 per application, applied in May and September with core cultivation.

on a USGA sand specified green with a 90% sand 10% compost mixture at the Lewis-Brown Turf Farm, Corvallis, OR. Experimental design is a randomized complete block design with four replications. Factors includes sulfur rates (0, 3 and 6 lbs of S per 1,000 ft2 annually) and calcium source (calcium carbonate, calcium sulfate and calcium phosphate all applied at 12 lbs of product per 1,000 ft2 annually and compared to untreated control).

Findings:

Sulfur significantly reduced the number of Microdochium patch infection centers observed in March and the number of fungicide applications made to manage Microdochium patch from November to May when using infection centers as an action threshold (Table 2). In comparison to the control sulfur applied at 3 and 6 lbs of S per 1,000 ft2 annually reduced March infection centers from 12.2 per 30 ft2 plot to 3.7 and 0.3, respectively. Sulfur applications not only slowed the infection process, but also resulted in fewer curative fungicide applications when using infection center development as an action threshold. Plots without sulfur required an average of 3.9 fungicide applications to manage the disease over an 8 month period (1 October 2013 to 31 May 2014), while plot receiving 3 and 6 lbs of S annually required 2.9 and 2.3 fungicides applications, respectively.

However, sulfur did decrease turf color and increase Anthracnose activity observed in the subsequent August (Table 2). It is important to note that fungicides were not applied to these plots after May 2014. While summer fungicide applications for Anthracnose would have likely prevented the disease, the disease association with sulfur and the decreased turf color observed in May are a concern.

Calcium source and interactions between sulfur and calcium source had no effect on infection center development, the number of winter fungicide applications, turf color or Anthracnose activity.

Table 2: Effects of sulfur rate and calcium source on percent Anthracnose cover (0-100%) observed on August 31, 2014 in Corvallis, OR.

Sulfur rate[z]	Turf color (1-9)	Percent Anthracnose cover (0-100%)[y]
0 lbs	6.5a[x]	3.2a
3 lbs	5.6a	8.7b
6 lbs	3.8b	7.8b
Calcium source[w]		
None	5.3a	5.9a
Calcium carbonate	5.3a	6.5a
Calcium sulfate	5.6a	8.2a
Calcium phosphate	5.0a	5.5a

[Z] 3 and 6 lbs sulfur per 1,000 ft^2 annually, applied at 0.25 and 0.5 lbs per month x 12 months, respectively.
[Y] No fungicides were applied to these plots after the conclusion of the May Microdochium patch scouting cycle.
[X] Within columns, means followed by the same letter are not significantly different according to LSD (0.05).
[W] All calcium sources were applied at a rate of 12 lbs product per 1,000 ft^2 per application, applied in May and September with core cultivation.